Appl. No.: 10/709,677
Amdt. Dated: 7/3/2006
Reply to Office action of: 04/06/2006

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

What is claimed is:

Claim 1 (currently amended) A system for protection against short-circuits in electric power distribution architectures at two voltage levels, comprising at least a first battery B1 at a first voltage level and a second battery B2 at second, higher voltage level, both provided with an automatic disconnection device SDB and intended ~~for~~ as a differentiated electric power supply ~~to~~ for respective network sectors, ~~provided with~~ said network sectors having power distribution units (10), (20), (30) directing power to ~~the~~ loads (12), (22), (23), (32), (33), each one of the units (10), (20), (30) being controlled by a corresponding microcontroller (10a),(20a), (30a), said at least first battery B1 and ~~sector or~~ sectors that it supplies being ~~susceptible of being~~ fed in turn from the second battery B2 through a converter DC/DC, said battery B2 being connected to a voltage generator, characterised in that said first battery B1, at a lower voltage level, has an associated module SMM ~~associated based on a~~ microcontroller ~~applied to~~ monitoring ~~at least~~ the voltage and current at the posts of said battery B1 and ~~to~~ sensing an operating state of said converter DC/DC, ~~which monitoring~~ said module SMM microcontroller of battery B1 is connected through a port ~~of its microcontroller~~ and a communications network N with each one of control microcontrollers (10a), (20a), (30a) of the power distribution units (10), (20), (30) ~~to~~ of the loads (12), (22), (23), (32), (33), in order to, facing a short-circuit situation sensed by said ~~monitoring~~ module SMM microcontroller, according to the detection of a predetermined state of the converter DC/DC, followed by ~~some~~ predetermined, sensed voltage and current values, inform each one of the microcontrollers (10a), (20a), (30a) of said power distribution units (10), (20), (30) in order to ~~carry out a short-circuit protection process~~ activate said automatic disconnection device SDB.

Appl. No.: 10/709,677
Amdt. Dated: 7/3/2006
Reply to Office action of: 04/06/2006

Claim 2 (currently amended) A system according to Claim 1, characterised in that said communications network N is a dedicated network ~~that links the microcontrollers (10a, 20a, 30a) of said power distribution units (10, 20, 30) or peripheral units thereof~~.

Claim 3 (currently amended) A system according to Claim 1, characterised in that said communications network N is a shared bus, ~~such as~~ preferably a CAN bus~~, that links the microcontrollers (10a, 20a, 30a) of said power distribution units (10, 20, 30) or peripheral units thereof~~.

Claim 4 (currently amended) A system according to Claim 1, characterised in that said ~~monitoring~~ module SMM ~~based on a~~ microcontroller~~or~~ control node CN is included in an assembly ~~applied to~~ for the dynamical measurement of the state of health (SOH) and state of charge (SOC) of said battery B1.

Claim 5 (currently amended) A system according to Claim 1, characterised in that said ~~monitoring~~ module SMM ~~based on a~~ microcontroller ~~or~~ control node CN is included in an assembly ~~applied to~~ for the control and management of all or part of the loads fed by said battery B1.

Claim 6 (currently amended) A system according to Claim 1, characterised in that said power distribution units (10), (20), (30) ~~to~~ of the loads (12), (22), (23), (32), (33) controlled by ~~a~~ said microcontroller (10a), (20a), (30a), ~~comprise a portion that supplies~~ supply loads (12), (22), (32) of said sector, at a lower voltage level, fed from battery B1, and ~~a portion dedicated to said power~~ said microcontollers (23a), (33a) supply loads (23), (33) included in said higher-voltage-level sector fed by said battery B2.

Claim 7 (currently amended) A system according to Claim 6, characterised in that said ~~power~~ loads (23), (33) are governed ~~from devices such as~~ by power switches (23a, 33a) ~~with current sensing~~, ~~the~~ said power switches (23a), (33a) ~~of which are~~ controlled ~~from the~~ by said corresponding microcontroller (20a, 30a) of ~~the~~ said power distribution unit (20), (30).

Appl. No.: 10/709,677
Amdt. Dated: 7/3/2006
Reply to Office action of: 04/06/2006

Claim 8 (currently amended) A system according to Claim 7, characterised in that said power switches (23a), (33a) are FET devices with current sensing.

Claim ~~9~~ 10 (currently amended) A system according to Claim 1, characterised in that each one of said batteries B1 and B2 is provided with ~~an electronic control~~ module SMM ~~based on a~~ microcontroller for controlling at least a disconnection device (SDB) of said batteries.

Claim ~~10~~ 9 (currently amended) A system according to Claim 7, characterised in that said power distribution units (10), (20), (30) comprise in cooperative combination ~~a connection of each one of~~ said power switches (23a), (33a) ~~to~~ and said respective microcontroller (20a), (30a) ~~of the corresponding unit (20, 30)~~ for ~~a prior~~ sensing ~~of~~ the voltage or impedance at the output of said power switches (23a), (33a) prior to ~~connecting the~~ said controlled load (23), (33), allowing avoidance of ~~said~~ connection to said controlled load (23), (33) ~~if~~ where said values are outside of ~~some~~ predetermined ~~margins~~ values.

Claim 11 (currently amended) A method for protection against short-circuits in electric power distribution architectures at two voltage levels, said architectures comprising: at least a first battery B1 at a first voltage level and a second battery B2 at a second, higher voltage level, ~~both~~ each of said batteries provided with an automatic disconnection device SDB and ~~destined~~ designed to provide a differentiated supply of electric power to respective network sectors ~~provided with~~ through power distribution units (10), (20), (30) to loads (12), (22), (23), (32), (33), each one of said power distribution units (10), (20), (30) being controlled by a corresponding microcontroller (10a), (20a), (30a), said at least first battery B1 and sector or sectors it supplies ~~being susceptible~~ capable of being fed in turn from the second battery ~~B1~~ B2 through a converter DC/DC, said battery B2 being connected to a voltage generator, said method characterised by performing permanent monitoring of at least the voltage and current at the posts of said battery B1, ~~at a lower voltage level,~~ as well as ~~of~~ the state of the converter DC/DC ~~which interrelates said two batteries B1 and B2, and in that, in case it is sensed that said state of the converter DC/DC goes on to become a predetermined one,~~

Appl. No.: 10/709,677
Amdt. Dated: 7/3/2006
Reply to Office action of: 04/06/2006

~~and after this~~ ; if said monitored voltage and current values exceed a ~~certain~~ predetermined threshold, each one of the microcontrollers (10a, 20a, 30a) of said power distribution units (10, 20, 30), is ~~informed~~ signalled through a communications network N ~~so as~~ to perform a short-circuit protection ~~process~~ power interruptions.

Claim 12 (currently amended) A method according to Claim 11, characterised in that during the short-circuit sensing step, sensing of a stoppage state of the conversion process of the converter DC/DC, acquisition of voltage at the posts of battery B1, at a lower voltage level, and finally sensing of a possible load current of said battery B1 are performed in an ordered and sequential manner, ~~so as to~~ and, if the predetermined values fall within pre-set ranges, ~~proceed inform to~~ signal the power distribution units (10, 20, 30) ~~about~~ of an eventual short-circuit situation, by sending a priority interruption signal through said network N to the microcontrollers (10a, 20a, 30a) ~~thereof~~.

Claim 13 (currently amended) A method according to Claim 11, characterised in that said short-circuit protection process comprises a complete disconnection of all the power loads (23, 33) associated to each one of the power distribution units (20), (30), and ~~in that, in case~~ where a short-circuit situation continues being sensed from said ~~monitoring~~ module SMM microcontroller control node CN, a signal is sent through said communications network N for disconnection of at least the higher-voltage-level battery B2, accessing in order to do so the disconnection device SDB of said battery B2 or a control node CN associated to said battery B2.

Claim 14 (currently amended) A method according to Claim 11, characterised in that in case said complete disconnection of loads (23, 33) leads to a non-short-circuit situation, as evaluated by said ~~monitoring~~ module SMM microcontroller control node CN, a reconnection of the power loads (23), (33) of each power distribution unit (20, 30) is performed until sensing the load or loads susceptible of generating said short-circuit situation, ~~as evaluated~~ is determined by said ~~monitoring~~ module SMM microcontroller control node CN.

Appl. No.: 10/709,677
Amdt. Dated: 7/3/2006
Reply to Office action of: 04/06/2006

Claim 15 (currently amended) A method according to Claim 14, characterised in that prior to performing the reconnection of each one of said power loads (23), (33), a measurement of the voltage or impedance at the output of a power switch (23a), (33a), ~~applied~~ to controlling a corresponding load (23), (33), is performed, and in that in case the measured values exceed a certain threshold, the involved load is left inactive.

Claim 16 (currently amended) A method according to Claim 11, characterised in that said short-circuit protection process comprises progressively disconnecting all the power loads (23), (33) associated to each one of the power distribution units (20), (30), and checking, from said ~~monitoring~~ module SMM microcontroller control node CN, if a certain disconnection makes the short-circuit situation stop, in which case a permanent disconnection of the load involved is carried out, and in that in case a short-circuit situation continues being sensed from said ~~monitoring~~ module SMM microcontroller control node CN, after disconnection of all the power loads (23), (33) of each power distribution unit (20), (30), a signal for disconnection of at least higher-voltage-level battery B2 is sent through said communications network N, accessing ~~in order to do so~~ disconnection device SDB of said battery B2 or a control node CN thereof associated to said battery B2.

Claim 17 (currently amended) A method according to Claim 11, characterised in that said short-circuit protection process comprises ~~supervising of~~ monitoring current demand in controlling devices, such as a power switch (23a), (33a), associated to each one of the power loads (23), (33) depending from each one of the power distribution units (20), (30), and disconnecting those loads wherein said demand exceeds a certain threshold, and in that, in case a short-circuit situation continues being sensed from said ~~monitoring~~ module SMM microcontroller control node CN, after the ~~supervision~~ monitoring of all the power loads (23), (33) of each power distribution unit (20), (30), a signal for disconnecting at least the higher-voltage-level battery B2 is sent through said communications network N, accessing ~~in order to do so~~ the disconnection device SDB of said battery B2 or a control node CN thereof associated to said battery B2.

Appl. No.: 10/709,677
Amdt. Dated: 7/3/2006
Reply to Office action of: 04/06/2006

Claim 18 (currently amended) A method according to Claim 11, characterised in that said power distribution units (20), (30) comprise devices such as power switches (23a), (33a)~~,~~ with current sensing, associated to each one of the power loads (23), (33), which power switches (23a), (33a) are controlled from the corresponding microcontroller (20a), (30a) of the unit, ~~and by~~ comprising a step of sensing the output state of each one of said switches (23a), (33a), particularly their voltage or impedance, ~~so that if the~~ and where a value sensed in a certain power switch (23a), (33a) exceeds a ~~certain~~ predetermined threshold, connection of the load (23), (33) associated therewith is not carried out.

Claim 19 (currently amended) A method according to Claim 11, characterised in that in case that at completion of said short-circuit protection process by each one of said power distribution units (10, 20, 30) a short-circuit situation continues being sensed by the ~~monitoring~~ module SMM microcontroller control node CN, disconnection of the two batteries B1 and B2 from their corresponding network sectors is carried out.